

Abstract

ETCH ENDPOINT DETECTION

A method for determining an endpoint for etching a layer includes steps of estimating the etch endpoint and, during etch, directing radiant energy at two or more wavelengths onto the layer to be etched, detecting the last intensity maximum reflected at a first wavelength prior to the estimated etch endpoint, and detecting the intensity maximum reflected at a second wavelength first occurring after the last intensity maximum at the first wavelength. Also, a method for determining an endpoint for etching a layer having an approximate initial thickness by steps of, during etch, directing radiant energy at three or more wavelengths onto the layer to be etched; selecting first, second, and third wavelengths; approximating an etch rate from the time interval between a first detected intensity minimum and an adjacent intensity maximum reflected at the third wavelength, estimating an etch endpoint from the approximate initial thickness of the layer and the approximate etch rate; detecting the last intensity maximum reflected at the first wavelength prior to the estimated etch endpoint; and detecting the intensity maximum reflected at the second wavelength first occurring after the last intensity maximum at the first wavelength. The material making up the layer is at least partly transparent to both the first and the second wavelength. The first wavelength is longer than both the second wavelength and the third wavelength. In some embodiments the third wavelength is longer than the second wavelength. The endpoint is at the point of intensity maximum of the second wavelength or is at a point following an interval thereafter.